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Experiencing Edublocks: A Project to Help Students in Higher Education to Select their Own Learning Paths

COLLECTION: GUIDANCE & SELF-REGULATED LEARNING

ARTICLE

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ABSTRACT

In this contribution, we want to share the experiences we had in a project that aimed at helping students select their own learning paths. Learning paths were a specific sequence of *edublocks* (learning activities) first-year students at the University of Barcelona could choose in a course: "Uses, possibilities and limits of information and communication technologies in social education". Students were provided with a technology-based network of learning communities of peers, teams of teachers and tutors and a large set of learning *edublocks*. At the center of the network we placed an App that allowed teachers and tutors to give very differentiated quantitative and qualitative feedback to their students, which turned out to be of great value for students who were confronted with the task of organizing their learning paths during their first semester. Results showed that students were very satisfied with the feedback they received while at the same time, teachers indicated that using the App did not place an additional burden on them. The strategy of individualization of learning with synchronous and asynchronous human support, managed through technological tools, encourages self-regulated learning. We start our contribution with an overview of different approaches to controlling learning paths, present some theoretical considerations concerning our Edublocks project, describe the project in detail and then offer and discuss results and our insights.

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1. INTRODUCTION

In the course of the 20th century, higher education has expanded remarkably, not only with respect to teaching content, but also with respect to the number of students who are able to enrol. While access to higher education used to be reserved for members of higher socio-economic levels, it has now turned into an educational space for all members of the new digital society.

The last decades have also seen a change in student-teacher relationships. During much of the 20th century, the teacher was a provider of knowledge while students were the recipients of this knowledge. Recent educational policies suggest that students should be more responsible for their learning, teachers should be their coaches in these learning processes, while offering flexible learning paths: "Flexible and open learning paths, part of the original inspiration for the Bologna Process, are important aspects of student-centred learning and are in increasing demand in our societies. In addition to full degree programmes, many higher education institutions offer or plan to offer smaller units of learning, which enable learners to develop or update their cultural, professional, and transversal skills and competences at various stages in their lives" (EHEA 2020: 6).

Such an approach will have to take into consideration that students differ with respect to a number of attributes: personal characteristics like abilities, learning styles, interests, goals and attitudes as well as cultural backgrounds. Because of these individual differences, it would seem to be reasonable not to force all students in higher education into one single learning path as they move through the stages of higher education, but to allow each student to choose her/his own individual learning path.

For educators, it is a challenge to design a training proposal that promotes self-regulated learning without falling into three excesses: too much support, which generates dependence on the teacher and low self-regulation; lack of support, which causes a sense of loss during the learning process; technological determinism, which means that technology is taking decisions that the teaching team should take.

The pedagogical design of individualised learning pathways, managed through digital environments/tools, with support from teachers, is an excellent strategy to find the balance between guidance and self-regulated learning.

In the past, several approaches were proposed which were to help students select their own learning paths: (1) human controlled learning paths (HCLP), (2) machine-controlled learning paths (MCLP) and (3) network-controlled learning paths (NCLP).

1.1. HUMAN CONTROLLED LEARNING PATHS (HCLPS)

The Dalton Laboratory Plan (Parkhurst 1922) and the Winnetka Plan (Corcoran 1927) may be viewed as responses to the massification of primary education. One of the basic ideas of these plans was that a student's individual learning path should be the result of an agreement between student and teacher, suggesting that a student should be capable of choosing her/his own learning path with the help of an educator. This idea is based on a constructivist interpretation of learning. Under this perspective, students construct their knowledge on the basis of their experiences (Piaget 1956; Bruner 1990), in a process that is eminently social (Vygotsky 1978). In the seventies, learning approaches like "individualized learning" and "personalized learning" were developed which were clearly grounded in constructivism (Weisgerber 1971). "Learning contracts" captured the agreement of a student and her/his teacher with respect to her/his future learning path (Stephenson, Laycock & Laycock 1993).

1.2. MACHINE CONTROLLED LEARNING PATHS (MCLPS)

There was another change as far as teaching is concerned in the second half of the 20th century. James (1899) considered teaching an "art", while Skinner (1965) suggested teaching should be done according to technological designs based on scientific principles. Skinner developed teaching machines which had originally been designed to be used for testing (Pressey 1926) thus giving rise to "programmed learning" that had its roots in behaviourism (Skinner 1968). Although these principles were developed for mechanical machines, they were then extended to learning without machines (Lumsdaine & Glaser 1960; Fry 1963). The concept of "program" may therefore be viewed as the most important outcome of this period, and programmed teaching reached a certain degree of popularity in higher education.

Programmed learning became fashionable when computers came into play creating the concept of Computer Based Learning (CBL). One of the best-known examples was PLATO, Programmed Logic for Automated Teaching Operations (Paden, Dalgaard & Barr 1977). The advent of personal computers (PCs) in 1965 gave new impulses to machine-based programmed learning. New "author languages" like Guide, HyperCard, ToolBook, Authorware allowed educators to create their own computer programs. However, in order to do justice to the complexity of more advanced learning processes, intelligent programs and computers were needed (Millward et al. 1978) as a result of which the concept of Intelligent Computer Assisted Instruction (ICAI) (Larkin & Chabay 1992) was introduced in the eighties. In the following decade, multimedia systems were designed which extended the use of these systems almost indefinitely, and finally, the Internet and the World Wide Web entered the world of education.

Basically, both forms of helping students to find their own learning paths (HCLPs and MCLPs) continue to be developed in parallel, but it is the second form which seems to benefit more from new advances in technology. "Intelligent tutors" (Chou, Chan & Lin 2003) were proposed, but were not very successful. In the new millennium, the concept of Adaptive Learning appeared (Karampiperis & Sampson 2005) which incorporates the use of learning analytics and big data in Technology Enhanced Adaptive Learning Environments (TEALE) thereby adjusting the learning process to the characteristics of the learner, like her/his learning style or her/his cognitive style (Hwang et al. 2013; Limongelli et al. 2009).

1.3. NETWORK CONTROLLED LEARNING PATHS (NCLPS)

In the new millennium, a new learning theory was proposed: connectivism (Siemens 2005). In connectivism, learning is conceived as a Personal Learning Network that is constructed in students' Personal Learning Environment (PLE) (Adell & Castañeda 2010).

This is a new approach to the problem of helping students to find their own learning path. A student's individual learning path is not controlled by a machine, nor is it the result of an agreement between student and teacher. Rather, it is the individual student who constructs her/his own learning path, but in interaction with other students and with educators and even with machines. This is made possible due to a wide variety of resources for learning which is reflected in initiatives like Open Educational Resources (OER), Open courseware (OCW) and MOOCs (Massive Open Online Courses). MOOCs introduce another new element: students not only are able to choose their own learning paths within a certain course, students may individualise their whole study program.

In our opinion, the best idea to do justice to students' need to individualise their learning paths is to provide them with a variety of *edublocks* from which they are to choose. These *edublocks* can be conceived as learning objects, each of which is designed to meet a specific learning need of a student; they are interchangeable like LEGO pieces. The concept of Reusable Digital Learning Objects is usually attributed to Hodgins (2002). Theoretically, the concept of Learning Objects (LO) is grounded in constructivism and also in Generative Theory (Bannan-Ritland, Dabbagh & Murphy 2002). However, later implementations are more closely related to connectivism (Vas, Weber & Gkoumas 2018).

We have tried to summarise and compare the three different forms of helping students to find their own learning path in Table 1.

Table 1 Learning paths.

DIMENSION	HCLPS	MCLPS	NCLPS
Theoretical foundations	Constructivism	Behaviourism	Connectivism
Path management	Student-Teacher	Machine	Student-Network
Assessment and feedback	By teacher	By machine	Multiple actors
Practical applications	Individualized learning	CBL, ICAI, TEALE	LO, OER
Dimension required for implementation	Group	Massive	Global

In our project, we decided to implement an approach based on network-controlled learning paths. We believe this approach is the most adequate for the situation students in higher education meet when they enter university because it gives control to the individual students, at the same time placing her/him in a supportive technology-based network of learning communities of fellow students, teams of professors and tutors and *edublocks* to be engaged in.

2. EDUBLOCKS: SOME THEORETICAL CONSIDERATIONS

2.1. EDUBLOCKS' KEY POINTS

The Edublocks project, former "Edublocs", was implemented at the University of Barcelona in the academic year 2018/19, and following years. The aim was to help students choose their own learning paths; a learning path was a specific, individually organized configuration of *edublocks* which were to be chosen from a wider set of *edublocks* offered to them. In order to achieve this, we created a technology-based network whose nodes were

- learning communities of small groups of students,
- teacher teams of current teachers and external collaborators, and
- *edublocks* offered by different teachers and collaborators who also provided feedback and assessment.

The project addressed four key points: (1) self-regulated learning (SRL) and feedback (FB), (2) path management: team teaching and network-based learning, (3) economic viability and (4) privacy and transparency.

2.1.1. Self-regulated learning and feedback

Several authors have pointed out the relevance of SRL for the digital society. The concept of SRL was initially presented by Zimmerman and Schunk (1998). Zimmerman (2000) characterised SRL as a cyclic process of (1) forethought, (2) performance or volitional control, and (3) self-reflection. Other authors have collected evidence that technology enhanced learning environments (TELEs) have a high potential for improving the SRL competence of students (Johnson & Davies 2014; Steffens 2006).

To some extent, SRL is related to connectivism where learning is understood as a students' growth process in the context of a networked environment (Bartolomé & Steffens 2011), a process which is largely initiated and organised by students themselves. SRL is also recognized as a critical competence that higher education students must achieve to prepare for the lifelong learning society (Anthonysamy, Koo & Hew 2020).

As educational institutions increasingly rely on external evaluations, formative evaluation is becoming more and more important (Rahman et al. 2021). Formative evaluation requires continuous feedback to improve learning (Black & Wiliam 1998). In these processes, student participation is essential (Tai et al. 2018) and is likely to improve students' SRL competences (Magno 2016; Panadero, Andrade & Brookhart 2018). Technology provides feedback by collecting, transforming and communicating information from students (Deneen & Munshi 2018).

As self-assessment is increasingly used in processes of formative assessment, its importance for SRL has also been pointed out (Panadero & Alonso-Tapia 2013). This is particularly true when digital technologies are used for self-assessment, either based on eportfolios (Alexiou & Paraskeva 2010) or on erubrics (Panadero & Romero 2014).

Developing students' SRL is one of the main aims of the Edublocks project. We tried to achieve this with the help of digital technology, under a connectivist interpretation of learning, providing an enhanced formative evaluation based on digital feedback mechanisms.

2.1.2. Path management: team teaching and network-based learning

Path management is key in every adaptive system. In systems with human-controlled learning paths (HCLPs), teachers are expected to provide students with their learning paths, while in systems with machine-controlled learning paths (CCLPs), computers suggest individual learning paths. The first solution is too expensive, while the second one seems not helpful in developing deep critical knowledge. Neither of the two approaches seems to support SRL development.

Edublocks empowers students to select their own individual learning paths as they are part of a technology-based network of learning communities, teams of teachers and tutors and *edublocks*.

2.1.3. Economic viability

One of the problems that has limited successful implementation of open environments of learning objects is assessment. Assessing achievements, detecting problems and providing feedback to students is a time-consuming task. In TEALE, Technology Enhanced Adaptive

Learning Environments, and other intelligent systems computers take care of this task, but this MCLP approach does not support the development of SRL competences.

Edublocks uses technology to improve teachers' work and to reduce their working time. This is achieved by an App, named TEA, that reduces the time spent on specific tasks, and by a design based on mass production strategies.

The tutor of a class group does assess her/his students; this is the responsibility of the teacher in charge of a specific learning activity. The formulation of individual feedback is facilitated by different strategies that are provided by the App. When teachers enter their feedback, they may take advantage of some options provided by the App:

- Standard rubrics for basic evaluation, with automatic scoring.
- Generalized comments, with individual adaptation mechanisms.
- Click and collect to generalize or reuse previous comments.

Of course, teachers may also enter individualized comments.

All the technology is based on open source software. To reduce the time that is often lost in network delays, the whole system works on its own platform, with very short running times, based on a shared Dropbox space, with a structure of small files to prevent conflicts between different users. It also allows teachers to work offline, in every location and under different conditions.

2.1.4. Privacy and transparency

Privacy and transparency are two important elements to consider in our digital society. In human activities, information is relevant for taking correct decisions, but at the same time, there is wide concern about privacy.

On the other hand, the evaluation process with its subsequent consequences for academic life and employment expectations requires a transparency in the communication of results to guarantee a fair process.

Edublocks keeps the personal information as well as individual reports on a private level, using individual e-mail messages to communicate with students, whereas all information about the course is distributed in open environments, so criteria, resources, etc. are publicly available. And the anonymized scores are also publicly available through a reliable blockchain-based system (Bartolomé & Lindín 2018).

2.2. EDUBLOCKS: THE PROJECT IN DETAIL

2.2.1. The course

The Edublocks project was first implemented in the course "Uses, possibilities and limits of information and communication technologies in social education" in the academic year 2018/19. This was a first-semester course which was offered from September to January. Students participated in four groups of about 30 totaling about 130 students; each group was accompanied by one professor. The project extended over a period of four years.

The course incorporated different aspects of using digital technologies, applying them in educational environments and critically reflecting on the role of these technologies in our digital society. Students had access to a rich variety of digital technologies. Competencies that the course seeks to develop are digital competency, the competency to work in a team and the competency to self-regulate learning. Later in their professional lives, these students will work in care homes, prisons and in centers for people with special needs.

From the first course, work was carried out in digital environments in a hybrid way. Face-to-face sessions were combined with some online sessions. In the same way, general group tutorials were conducted face-to-face while individual (or working group) tutorials were conducted online. This methodology facilitated the transfer to online learning during COVID, when all face-to-face sessions were conducted via videoconference.

A learning space is provided for students to acquire the skills of the Digital Teacher Framework (Castañeda et al. 2021), which considers three main dimensions: pedagogical practices, professional learning environments and social commitment. These are dimensions on which they build their learning while at the same time forming part of the pedagogical model in which they are being trained.

2.2.2. Students

Since the course was offered to first-semester students, these students had no prior experience in selecting their own learning paths. Basically, we were able to distinguish between two types of students: (1) students who came from secondary high schools with a certain degree of academic competency, but with little knowledge of the field of social education, and (2) students with some vocational training whose academic competencies were rather low but who had already had some practical experiences in their professional fields.

In both cases, these students may be characterized as having an empathetic and helpful attitude towards other people. On the other hand, they exhibit a rather low level of knowledge concerning digital technologies, combined with a more negative attitude towards these technologies.

2.2.3. Edublocks

At the beginning of the academic year, each of the four student groups was assigned to one professor who accompanied them during the academic year. These professors formed a team which was extended by other faculty members and experts. Each professor assumed responsibility for three or four *edublocks*, depending on the field of specialization.

The *edublocks* which were prepared by the team of professors can be grouped into five categories:

- Seminars: These took place during one or two consecutive weeks. Students were expected to read a number of texts, participate in group discussions and hand in a work, which could be plain text or of audiovisual or multimedia format, which was to focus on the use of specific technologies.
- Workshops were distributed over the semester, had a more practical character and expected students to develop some practical application of specific digital technologies.
- Conferences: Students participating in a conference had to read an academic text, take part in a discussion and prepare a short reflection.
- Symposium: Towards the end of the semester, students had to work in groups to prepare a poster related to the topics on which they had worked previously.
- Book: Students were asked to prepare either individually or in a small group an academic text of about 10 to 20 pages. Best papers were selected to be included in a book that was published at the end of the course. The publishing process included several revisions to ensure a certain level of quality.

Table 2 shows the distribution of *edublocks* in their categories over the years.

Table 2 Edublocks.

EDUBLOCKS	2018–2019	2019–2020	2020–2021	2021–2022
Seminars	3	3	3	4
Workshops	6	5	6	5
Conferences	4	4	3	4
Symposium	1	1	1	1
Book	1	1	1	1
TOTAL	15	14	14	15

From the very first day, students had access to a platform Table 3 which contained information about each activity, the organization and the project as well as information about how to contact tutors and professors, how to send reports on *edublocks* performed and other forms.

Table 3 Links to the information platforms.

ACADEMIC YEAR	PLATFORM
2018–2019	https://www.symbaloo.com/mix/edublocs
2019–2020	https://www.symbaloo.com/mix/usostic2019-20
2020–2021	https://www.symbaloo.com/mix/usostic2020-2021
2021–2022	https://www.symbaloo.com/home/mix/usostic-2021-2022

2.2.4. The creation of learning paths and the Personal Learning Environment (PLE)

During the first two weeks, students were informed about the course. In this context, students had to complete a questionnaire regarding their digital competencies with special focus on the *edublocks* contents and SRL competence. They were also able to look at the *edublocks* and their calendar and contact tutors and professors in charge. Data were analyzed and in the second week, students received a report suggesting to them which *edublocks* they should select. The report also included information about *edublocks* which they should not engage with, be it because they already exhibited the competencies to be developed with these *edublocks* or because they did not show the necessary prerequisite competencies. Student were to select at least five *edublocks* and were then to send their choices to their tutors who accepted them or suggested changes.

In the course of the semester, students created their Personal Learning Environments (PLEs) which were based on a tool for shared bookmarks which included the *edublocks* they wanted to engage in as well as other resources that were offered to them.

In using the various learning objects, students are free to choose the digital tools and environments with which they work and submit their homework to an accessible URL. This fosters SRL in acquiring digital competence in teaching, even if it is an action limited to one subject, which should be systemic to promote true digital transformation (Viñoles-Cosentino, Sánchez-Caballé & Esteve-Mon 2022).

2.2.5. Technology Enhanced Assessment (TEA)

When we designed the assessment system/environment, we took into account that analytical evaluation systems generate some problems. If we evaluate students' achievements with rubrics (which we also did), the resulting scores will tend towards the mean which means that it is unlikely that a student will receive the highest or the lowest score possible. We saw the same effect with scores summed over all the *edublocks* a student engaged in. Therefore, tutors were allowed to slightly change the sum of the scores on the basis of a more holistic assessment which also took into consideration students' efforts, their participation and their achievements compared to their initial competencies.

In order to manage evaluation processes, we developed an application which we called Technology Enhanced Assessment (Figure 1) which was accessible to all participating professors.

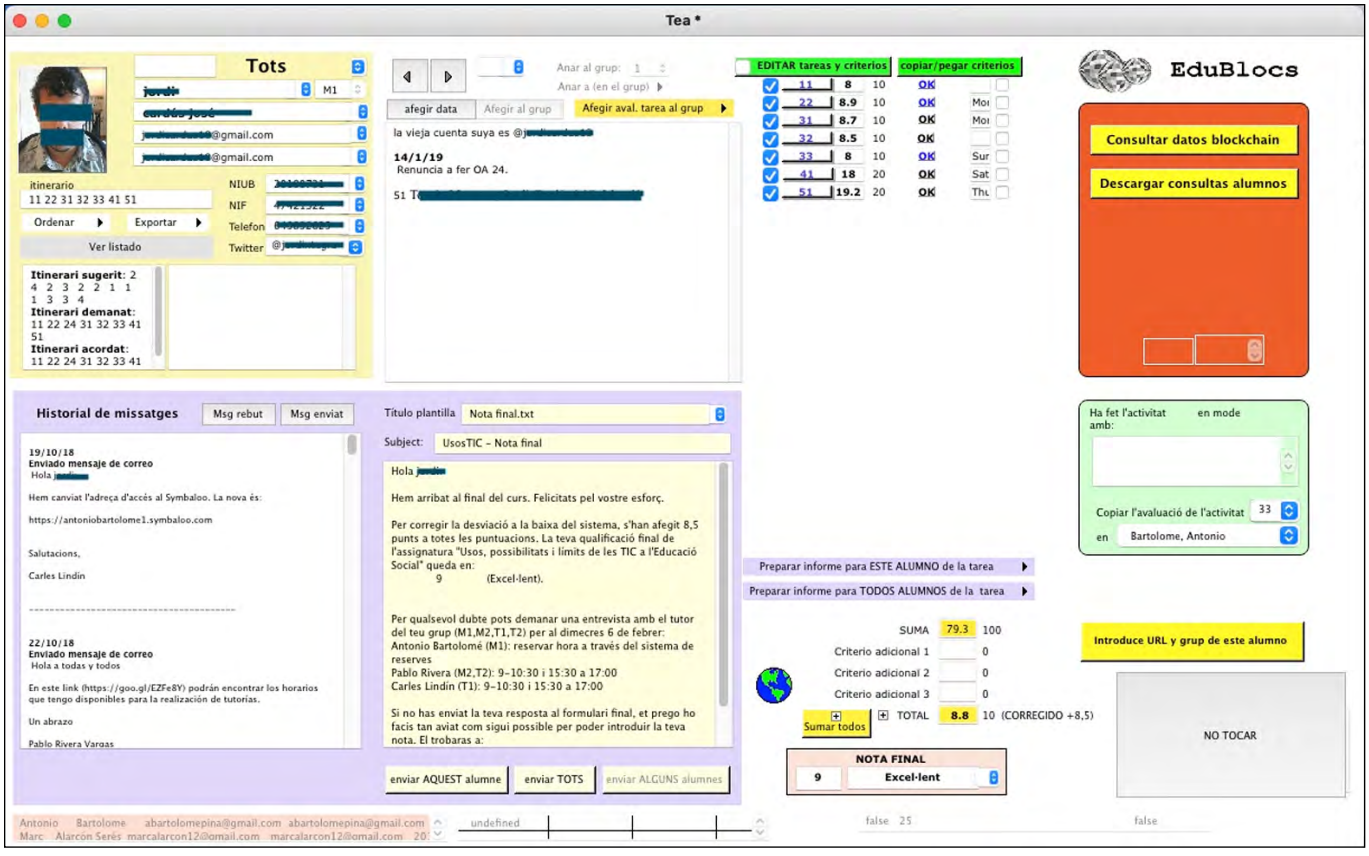

Figure 1 Technology Enhanced Assessment (TEA).

For each student, the App contained a variety of information about the respective student, among others her/his learning path and her/his scores in different *edublocks* (upper left corner of Figure 1). It was possible for a professor to add annotations during the course (upper center). Professors were provided with options to organize their email contacts with students (lower left corner, in blue). Information about the *edublocks* a student engaged in, the corresponding scores and maximal scores are presented in the upper right-hand side of Figure 1.

Based on the data stored in the App, professors were able to send reports to a single student or to a group of students (lower right-hand part in Figure 1) via an e-mail, which was automatically created. Teachers were able to send a large number of reports in very little time (less then 15 seconds for 50 reports). The report contained information about the evaluation that was based on a set of rubrics. In addition to this quantitative information, the App also offered professors the opportunity to create more qualitative feedback for each activity the student participated in by providing a set of evaluative statements which could be used to create the feedback (opening another window in the App) (Figure 2). Other windows could be opened to export or import data.

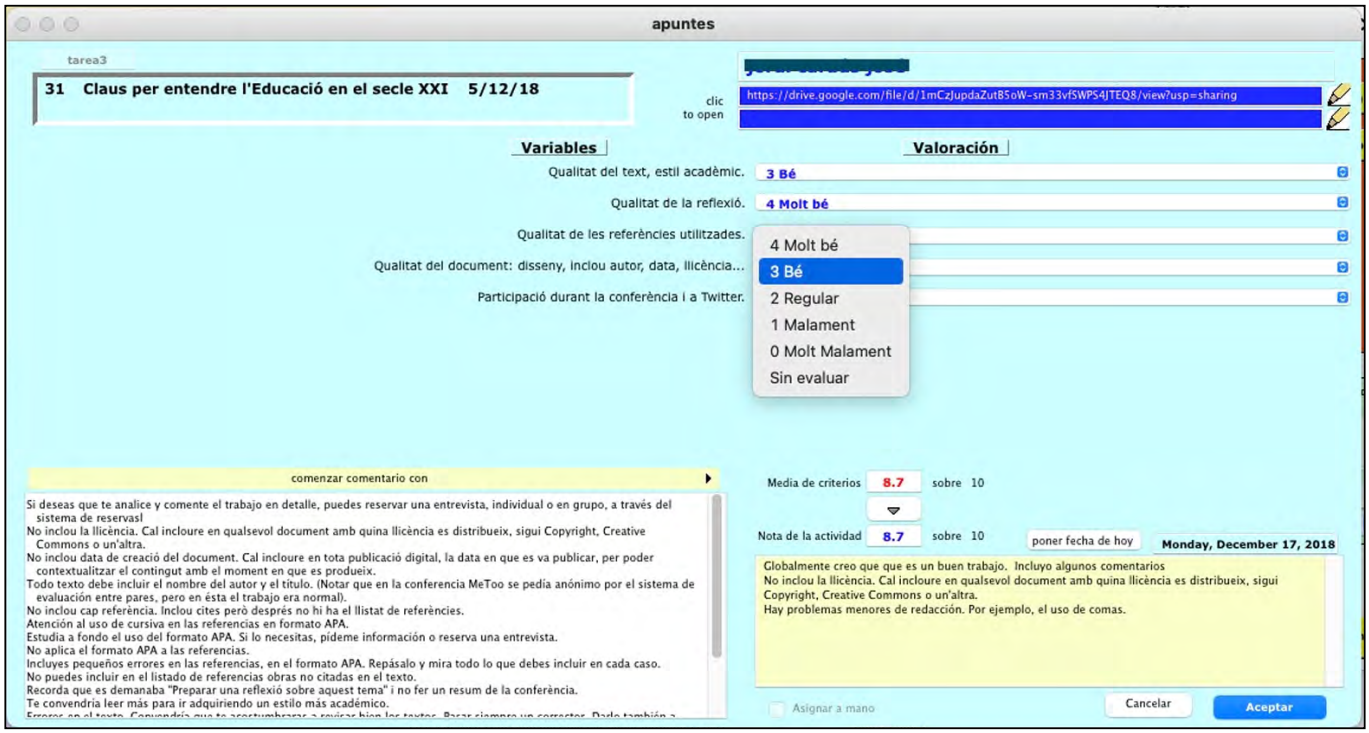

Figure 2 Assessment interface for each *edublock*.

In addition, the App allowed professors to create global reports covering groups of students (lower right-hand part in Figure 1). The App also contained an interface to create certifications of acquired learning using a system developed with blockchain technology (upper right-hand part in Figure 1, in red).

Finally, the App contained an interface to create certifications of acquired learning using a system developed with blockchain technology (top right of Figure 1, in red).

2.2.6. Blockchain

In education, blockchain technology makes it possible to certify acquired learning. We use it for two purposes. On the one hand, to certify each of the LO's learnings, considering the diversity of paths chosen by the students. On the other hand, as a strategy for self-regulation: each student could access the evaluation incorporated in the blockchain system of each LO and compare it with the average of the group without accessing the private information of the others, thus ensuring a high degree of security and transparency.

The information students were able to see included their different scores, the effort they had shown, the time used and the final score for the course. The interface for entering and viewing the data was prepared by a company specialized in these matters.

2.2.7. Balance between guidance and self-regulated learning (SRL)

The balance between guidance and self-regulated learning is established along three axes: freedom, responsibility and support. Students can choose the itinerary they consider according to their interests or previous knowledge. In addition, for each of the learning objects they will carry out, they can select (following certain rules) the specific topic or field they want to deal with, the day and time they will attend, the time they will hand in the task, the group of classmates with whom they will work and the group of classmates with whom they will hand in the activity to be assessed (in the case of individual tasks, they are encouraged to work collaboratively in the processes). These decisions have a direct impact on the empowerment of SRL as students are responsible for directing their learning. They are responsible for deciding what they want to learn, when, how, and with whom (as different teachers teach the learning objects). They can even bypass the completion of a learning object if they consider that they are already at an adequate level of learning according to the continuous assessment, or incorporate new learning objects to improve the final assessment, if they have received low evaluations during the training process.

We use three support strategies to balance guidance and self-regulated learning: synchronous tutorials, compulsory cross-curricular activities and individualised quantitative and qualitative feedback. Synchronous tutorials (in class or online) can be group-based, for general aspects of the course, or individual, for individual students or working groups. During the course, work is carried out on two learning objects compulsory for all students: participation in a congress on the subject and the writing of an academic article. At the congress, students present their papers in poster format to the rest of their classmates, who co-evaluate them. As an extension of the congress research, an academic article is written following the usual formal and content characteristics. These two actions bring together the students' perspectives and are set as the ultimate learning objective. Finally, for each assignment delivered, they receive an individualised quantitative assessment (through a rubric based on the shared assessment criteria) and qualitative assessment (based on highlighting positive aspects of learning and pointing out areas for improvement), which can be commented on in a return tutorial, if deemed appropriate.

3. EXPERIENCE EVALUATION METHOD

We analysed the teaching and learning experiences from a mixed perspective. We used quantitative and qualitative data (Morse & Niehaus 2009) according to the research objectives and the type of data collected (Johnson & Onwuegbuzie 2004). At the same time, we carried out a triangulation since we were dealing with two different groups of subjects: teachers and students.

We set out to study the quality of the feedback provided by the teachers as well as students' satisfaction which gave us the opportunity to investigate the connection between them.

Concerning the teachers, we analysed quantitative data obtained from the TEA logs during three consecutive academic years (2018–2021): (a) the number of comments and the phraseology shared by teachers in the writing of qualitative assessments (Table 4) and (b) the number of feedback reports and their length (Table 5).

For the students, we analysed the data provided by the university through the satisfaction survey carried out for each subject during its development (before the final assessment) during the same period (Figures 3, 4 and 5; Table 6).

4. FINDINGS

While the Edublocks project includes a variety of aspects, here we will focus on how the TEA App and the design of the system influences the evaluation strategies of the professors, creating individual reports for the students. Our main objective was to help professors create qualitative feedback reports with respect to a specific activity for a large number of students.

4.1. SHARED COMMENTS

In creating feedback reports for students, professors were able to use comments that they or the other evaluators had used before. We therefore wanted to know if sharing these comments and re-using them had increased over time, which would be an indication that the system provided had gained acceptance and that professors saw its advantages. This was indeed the case (see Table 4, data were available only for the first three years).

Table 4 Shared comments created by the professors.

ACADEMIC YEAR	2018–2019	2019–2020	2020–2021
Number of comments	91	125	177
Mean length of comments (chars)	74,1	99,8	65,2

The system also provides professors with incomplete comments like "In sum, my impression is that your work …". These incomplete comments may then be completed individually for each student, again saving time in writing the evaluation.

Re-using comments makes it possible to systematise and focus on the content of messages. There is an expansive effect in the 2019–2020 academic year: the number of comments and their length increase. In the 2020–2021 academic year, the increase in shared comments allowed teachers to (a) write shorter, more precise, more direct and systematised shared messages, while (b) the increase in comments replaced the length of the messages.

4.2. INCREASE IN THE NUMBER OF FEEDBACK REPORTS

Another question we were interested in was whether the use of the App would lead to an increase in qualitative feedback reports. This was actually the case (see Table 5).

Table 5 Number of feedback reports and corresponding length.

ACADEMIC YEAR	2018–2019	2019–2020	2020–2021
Reports sent	632	770	891
No. of characters per report	464	406	529

The increase in the number of feedback reports is certainly due to the fact that the number of students and the number of *edublocks* they selected increased over the year. The interesting thing is that while this also meant an increase of work for professors, they did not have the impression that they were investing more time in their work.

4.3. STUDENTS' OPINIONS

In order to assess students' satisfaction with the evaluations they received, we turned to an external indicator. In our university, each year students are asked to fill in a questionnaire related to the quality of the institution. These items were as follows:

1. In general, I am satisfied with the course.
2. The formative activities (classes, exercises, seminars etc.) have been adequate to profit from the course.
3. In my opinion, the evaluations that I received were adequate for my learning.
4. There was a good correspondence between the tasks that needed to be done and the number of credit points for the course.
5. The study material and the information material have been useful for my learning.

Students were asked to indicate the degree of agreement with each item on a scale from zero to ten.

In 2020–2021 the second item was split into two. Therefore items 3, 4 and 5 became items 4, 5 and 6.

Results are shown for three academic years in Figures 3, 4 and 5. The blue line depicts the mean values of those students who attended the course while the little red squares depict the mean values for students of all the courses. It can be seen that students' opinions became increasingly positive over the years.

Figure 3 Students' opinions 2018–2019.

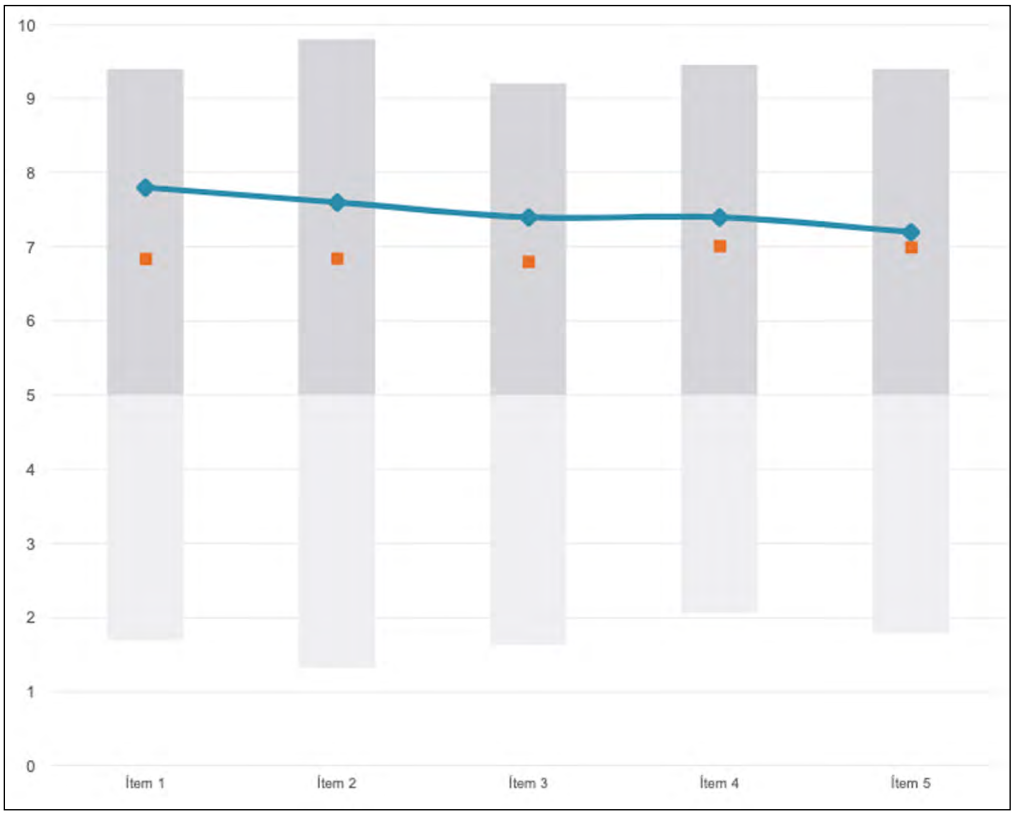

Figure 4 Students' opinions 2019–2020.

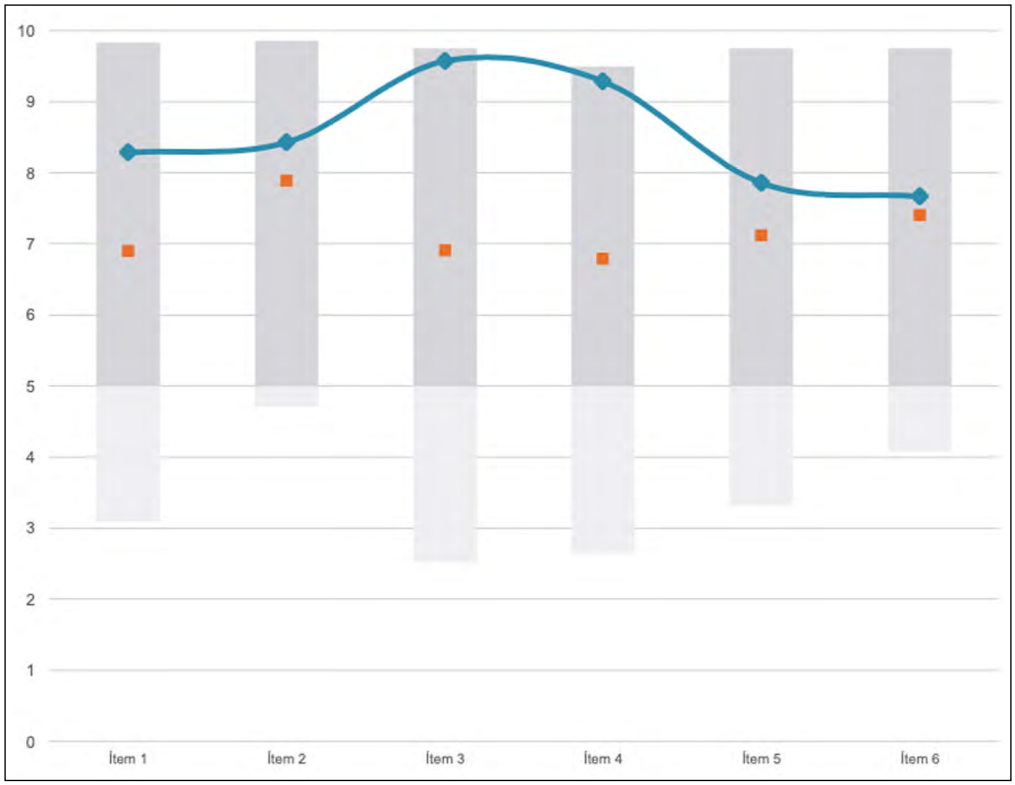

Figure 5 Students' opinions 2020–2021.

We were particularly interested in students' opinions regarding the evaluation process and therefore had a closer look at Item 3: "In my opinion, the evaluations that I received were adequate for my learning". Results for our course as well as mean scores for all courses in the study program are shown in Table 6.

ACADEMIC YEAR	2018–2019	2019–2020	2020–2021
Mean score for our course	6,2	7,4	9,6
Mean score for all courses of the study program	6,8	6,8	6,8

Table 6 Item 3: In my opinion, the evaluations that I received were adequate for my learning.

While the mean score for all the courses of the study program remains unchanged, the assessment of the quality of the evaluation process provided by the students on our courses improved over the years, reaching almost the maximum value in the third year.

4.4. WHAT WE LEARNED

At the end of each academic year, the team of professors meet to evaluate and revise the design of the project. These are some of the most important points that emerged:

Concerning *edublocks*, it seems that the concept of micro-activities, which is more in line with the concept of micro-learning or that of traditional learning objects, should be discarded in favor of *edublocks* which require one or two weeks of work. There is a danger of fragmenting the course. Students complain about the high demands of the course, even though the perception of the course is very positive.

As regards the evaluations, we need to think about how to compensate for the fact that, due to the evaluation system, it is practically impossible to achieve a score higher than 90 (out of 100).

We also observed that our students developed different learning paths including different *edublocks*. We are not sure if the minimum requirements students have to fulfill in order to pass the course will ensure that students will have acquired the competencies they will need in their professions.

The large variety of *edublocks* offered by different professors has pointed to the need to give more importance to the role of tutors. Two suggestions were made:

- Increase the number of interviews a tutor conducts with single students or groups of students.
- Arrange for a meeting between tutor and her/his group of students every three or four weeks to see how the course is doing and to clarify problems.

In summary:

- On the students' perception/evaluation: (a) high demand of the course, (b) preference for single-session LO and (c) positive view of the training experience.
- Teachers' perception/evaluation: (a) need to maintain a common thread of learning so that it is not seen as a succession of fragments of learning, (b) opportunity to increase the number of tutoring sessions to encourage the acquisition of competencies necessary to promote the development of skills and (c) appropriateness of incorporating criteria of effort, evolution and perseverance to compensate for the difficulty of accessing the maximum assessment.

5. DISCUSSION AND CONCLUSIONS

In this article, we wanted to share our experiences with the Edublocks project, a project aimed at helping students to select the learning path which is most appropriate to their faculties, needs and interests and which on the other hand is sufficient to help them develop the competencies they will need in their future professions. Basically, these learning paths are constituted by a specific configuration of *edublocks*.

We chose a network-controlled learning pathway (NCLP), in which students generate their Personal Learning Environment (PLE) (Adell & Castañeda 2010) while interacting with peers, trainers and technological environments as they choose the steps of their pathway (Hodgins 2002).

Given the limitations imposed by the fact that the course was situated in the context of other courses which still follow more traditional methods, we conclude that we succeeded in offering students a very differentiated feedback, without asking professors to rely too much on older methods. Students perceived the feedback to be very positive and it helped them to develop strategies to select their learning paths and thereby develop elementary aspects of self-regulated learning. This was supported by the fact that students needed to reflect on their own learning when they handed in their work. From the results (Tables 4 and 5 on feedback provided by teachers; Figures 3, 4 and 5, and Table 6 on student perception), we can establish a connection between the improvement in student assessment and the feedback provided. This assessment must also be related to the design of the individualized pathway, and the support received, which some students shared informally. The balance between pedagogical design, face-to-face and digital support, and follow-up fosters good learning pathway selection and SRL.

Both reported feedback, which provokes foresight, action and self-reflection (Zimmerman & Schunk 1998), and technology-enhanced learning (Johnson & Davies 2014), improve SRL. This, in turn, impacts readiness for lifelong learning (Anthonysamy, Koo & Hew 2020).

We arrived at these conclusions on the basis of a comparative analysis of various indicators over the three years of our study. The feedback reports issued by the professors and the TEA App which they used clearly show that professors were using an increasing number of resources in preparing the reports and that these reports increased in length. The studies that were carried out by our university to assess the degree of students' satisfaction also show that students were satisfied with the process of evaluation, and this satisfaction also increased in the course of the three years.

It has been pointed out that positive results concerning teaching methods may be not so much an effect of the method studied, but more related to the fact that the method studied was new, some kind of Hawthorne Effect (Sedgwick & Greenwood 2015). In our study this does not seem to be the case; we found that over the years, increasingly positive results were obtained.

We also found that it is possible to personalise learning by allowing students to create their own learning paths by choosing a specific configuration of *edublocks* from a variety of *edublocks* that are offered within a framework of requirements. At the same time, this approach does not require additional efforts on the part of the professors; nor does it reduce the quality of the feedback students receive. This was achieved by using technological tools which were developed to save time and make the task easier.

The freedom of students to choose pathways and partners for LOs, the responsibility needed to make decisions and self-direct learning, as well as the support of teachers, provide the necessary balance between guidance and self-regulated learning.

This open methodology could lead to the desertion of the subject or cause a sense of loss among the students, as each one has her/his own itinerary with their teachers, and their relationships with the efforts of homework, class attendance and delivery of work differ from that of their peers. In this sense, the three support strategies provided to students are also essential: synchronous tutorials, compulsory cross-curricular activities (symposium and book) and individualised quantitative and qualitative feedback.

Our approach makes it possible to pay attention to the individual student without falling into the trap of leaving all control to machines. Solutions like TEALE which are based on big data and artificial intelligence have not yet reached the quality of an approach that is based on human interaction facilitated by machines which are used for repetitive activities.

In this experience, technology is an essential support to provide the best continuous support to the student while allowing the exchange of information between teachers. Therefore, the improvement in SRL is a consequence of the pedagogical design, the synchronous and asynchronous support and the monitoring and feedback managed through TEA.

The flexibility of the course, especially the monitoring and digital support, made it possible to adapt quickly to the COVID context.

COMPETING INTERESTS

The authors have no competing interests to declare.

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